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## IMITATION IN RACCOONS

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This paper is, in certain respects, supplementary to work which has already been published by Cole,<sup>1</sup> and by the present writer.<sup>2</sup> The same four raccoons which served as subjects in those earlier investigations were employed in the present study. At the time when these later experiments were undertaken, the animals were seven months old. They had all been trained, for a period of nearly three months, in 'puzzle-box' and other tests; but, with the exception of one individual, they had had no experience with experiments similar to those which were here undertaken.

For the purposes of comparative psychology, three sorts of imitation may be distinguished. *Instinctive* imitation is illustrated in the reaction of the chick which pecks at an object on seeing another chick do so. *Gregarious* imitation is exemplified by the stampede of the herd when one of its number becomes alarmed and flees. When a monkey sees one of its fellows obtain food by pressing a lever and releasing a door, and himself proceeds to an intelligent performance of the same act, we have a case of *inferential* imitation. The present study is concerned with an investigation of this higher, or inferential type of imitation.

Our apparatus consisted of an inclined plane of poultry netting, 1.5 m. long by 25 cm. wide; it was supported at one end upon a box, in such fashion that it extended in a slightly upward and diagonal direction across a corner of the room to a platform, which was 30 cm. wide and 50 cm. long. The platform was 90 cm. high; and the other end of the inclined plane was 65 cm. above the floor. At the lower end of the plane, stood a box-step, 32 cm. high, by means of which the raccoons could easily climb upon the plane.

At a given signal, the raccoon went up the step and along the plane to the platform, where he was fed. The experimenter stood at a distance of about a meter from the plane. In earlier experiments, one of the raccoons (Jim) had learned to go up to the platform to be fed. He now served as imitator, while the other three animals were employed as possible imitators of his acts. The procedure consisted in releasing the imitator in the room where he was able to make several observations of Jim's performance of the act of climbing and obtaining food. Immediately afterwards, the imitator was given an opportunity to perform the act alone. We kept a record of the number of times that he clearly saw the act performed, of the number of times he probably saw it, of any apparent tendency to imitate, and of all other significant facts.

Tom. *First day.* Tom was present in the room while Jim went through twenty-one repetitions of the act of going up the step, and along the plane to the platform and receiving food. Tom apparently<sup>3</sup> saw seven of the twenty-one repetitions of the act; and he probably saw the act in five other repetitions. Then Tom was placed in the room alone, in order that

<sup>1</sup>L. W. Cole: Concerning the Intelligence of Raccoons, *Jour. Comp. Neur. and Psychol.*, XVII, 1907, 211-261.

<sup>2</sup>W. T. Shepherd: The Discrimination of Articulate Sounds by Raccoons, *Amer. Jour. Psychol.*, XXII, 1911, 116-119.

<sup>3</sup>This qualification is necessary because it is difficult to be entirely sure that one animal has really seen the action of another.

he might imitate Jim's reaction under similar conditions. He failed to accomplish it during a period which lasted one minute and twenty seconds *Second day*. (Six days after the first trial.) Tom saw Jim perform the act three times; and he probably saw the reaction five times in all. When tested alone for a period of ten minutes, he failed to repeat the act,—indeed he showed no indication of any tendency to imitate Jim's reaction. *Third day*. (One day after the preceding trial.) Jim's reaction was seen four times, and probably was seen nine times, in all. When tested alone, Tom gave no indication of any tendency to imitate, and had not accomplished the act at the end of ten minutes. In three of Jim's repetitions, however, after the imitator had performed the act and was eating his food, or had just eaten it on the platform, Tom went up also and sniffed about on the platform.

*DOLLY. First day.* Dolly was in the room while Jim went through the act fifteen times. She saw four of his reactions, and probably saw eight more. When tested alone, she showed no tendency to imitate, and had not accomplished the act at the end of ten minutes. *Second day*. (Seven days later.) She saw Jim's reaction eleven times, and probably saw it three times more. During his tenth reaction, she went up the plane and to the platform, where she sniffed about. During the subsequent test of her imitation, she climbed upon the experimenter for food, and rambled casually about the room. She then went up the step to the plane, and down again, and again wandered about the room.

*JACK. First day.* Jack saw six of Jim's twenty-one reactions, and probably saw seven more. During Jim's eighth reaction, Jack went up the step, and crossed the plane to the platform, where, if one may judge from his actions, he seemed to expect to be fed. But when tested alone immediately afterwards he wholly failed. In no way did he indicate any tendency to imitate Jim's reaction. *Second day*. (Five days later.) Jack saw seven of Jim's reactions, and probably saw four others. During the progress of Jim's fifteenth reaction, Jack went up the step and partially up the plane to a coat which hung upon the wall near-by. Jim had already gone to the platform. Jack did not appear, however, to expect food. In the first trial where Jack was tested alone, after the usual signal had been given, he played about the room, went to the window and to various boxes in the room; he finally ascended the step and the plane to the platform and was fed there. His time for this trial was two minutes and fifteen seconds. When the signal was given for the second trial, he went up on a box at the other side of the room, and looked at the experimenter for food,—as it appeared. Finally, he went to the platform and was fed. In the third trial, his behavior was similar to that in the second trial. He went up to the platform in twelve and a half seconds. In the fourth trial, he did the act in twenty seconds, first going part way up the plane and looking toward the experimenter. In the fifth to the eighth trials, his behavior was similar to that during the fourth trial; his times for the accomplishment of the act during these trials were thirty-seven, twenty-five, thirty-two, and thirteen seconds respectively. In the ninth trial he reacted correctly in eleven seconds; and in the tenth, in thirteen seconds. In both of these latter trials he made but a brief stop during the act of ascending the plane.

The results of these experiments may be regarded as wholly negative. When tested alone, after seeing Jim's reactions, neither Tom nor Dolly made any attempt to imitate the act which they had just seen. It is true that they went up the step or up the plane during the process of Jim's reaction; and Tom's behaviour on the third day,—when on three occasions he went up on the platform where Jim was eating,—seems to be imitative. But if the raccoons perceived the results of Jim's reactions, it is difficult to understand why they did not themselves react to that intelligent perception of the results of Jim's actions, when tested for a period of ten minutes immediately afterwards. It seems probable that some mental process

of no higher order than 'instinctive' imitation is sufficient to account for these reactions.

Jack's reactions appear to be somewhat more doubtful. But when we consider all of the evidence, and especially when we note his hesitating behavior on the second day—where he apparently had formed, or almost formed, the appropriate associations,—it would appear that we may attribute his learning to the humbler procedure of 'trial and error,' and not to an 'inferential' imitation of Jim's reactions.

We conclude, therefore, that these brief experiments have failed to show that 'inferential' imitation (involving ideation) is a part of the mental equipment of the raccoon. And it may be recalled that another investigation of imitation, in which we employed the same animal,<sup>1</sup> yielded wholly negative results. Davis's<sup>2</sup> interesting observations of the raccoon likewise failed to reveal the presence of the higher form of imitation.

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<sup>1</sup>L. W. Cole: *Op. cit.* pp. 232-235.

<sup>2</sup>H. B. Davis: 'The Raccoon; A Study in Animal Intelligence.' *Amer. Jour. Psychol.*, XVIII, 1908, 447-489.